CLAIMS:

What is claimed is:

1. A laser comprising:

a housing defining a plurality of compartments therein;

a waveguide disposed within the housing, the waveguide defining a plurality of channels having a substantially rectangular cross section for guiding a laser beam;

a plurality of electrodes disposed within the plurality of compartments and positioned along opposite surfaces of the waveguide; and

at least one power supply connected to the plurality of electrodes.

2. The laser as set forth in Claim 1 further comprising a shield disposed within the housing for electrically isolating the plurality of electrodes.

3. The laser as set forth in Claim 2 wherein the shield includes a plurality of fingers extending from the shield.

4. The laser as set forth in Claim 3 wherein the waveguide includes a plurality of holes for receiving the fingers extending from the shield.

5. The laser as set forth in Claim 2 wherein the shield is disposed a prescribed distance from the plurality of electrodes for preventing electrical arcing between the shield and the plurality of electrodes.

6. The laser as set forth in Claim 2 wherein the housing includes an opening in a first surface thereof allowing passage of the shield therethrough for maintaining electrical contact between the shield and the housing.

7. The laser as set forth in Claim 1 wherein the substantially rectangular cross section includes at least one rounded corner.

8. The laser as set forth in Claim 1 wherein the waveguide is disposed within the housing a prescribed distance from the housing for preventing electrical arcing between the waveguide and the housing.

9. The laser as set forth in Claim 1 further comprising at least one inductor connected to the plurality of electrodes and to the power supply for tuning out the capacitance of the plurality of electrodes.

10. The laser as set forth in Claim 9 wherein the plurality of inductors are disposed within the housing a prescribed distance from the housing for preventing electrical arcing between the inductors and the housing.

11. The laser as set forth in Claim 1 further comprising a heat exchanger for transporting heat away from the laser.

12. The laser as set forth in Claim 11 wherein the heat exchanger is in fluid communication with the laser.

13. The laser as set forth in Claim 12 wherein the heat exchanger comprises a passage in the laser housing for carrying coolant therethrough.

14. The laser as set forth in Claim 12 wherein the heat exchanger comprises a plate mounted to the laser housing defining thereby a passage for carrying coolant therethrough.

15. The laser as set forth in Claim 11 wherein the heat exchanger comprises a set of fins mounted to the laser.

16. The laser as set forth in Claim 9 further comprising a mechanism positioned between the at least one inductor and the laser housing providing thereby a force retaining the at least one inductor within the plurality of compartments and an electrical connection between the at least one inductor and the laser housing.

17. The laser as set forth in Claim 16 wherein the mechanism comprises a spring.

18. The laser as set forth in Claim 16 wherein the mechanism comprises gold plated Beryllium Copper.

19. The laser as set forth in Claim 16 wherein the mechanism comprises a low inductance electrical connection.

20. The laser as set forth in Claim 1 further comprising an electrical circuit connected to the power supply and to the at least one inductor providing thereby phase and impedance matching between the power supply and the at least one inductor and the plurality of electrodes.

21. A laser comprising:

a housing;

a waveguide disposed within the housing, the waveguide defining a plurality of channels having a substantially rectangular cross section for guiding a laser beam, the channel cross section having a prescribed width to height ratio for a prescribed total length of the plurality of channels; and

a plurality of electrodes positioned along opposite surfaces of the waveguide.

22. The laser as set forth in Claim 21 wherein the prescribed width to height ratio of the channel cross section for a prescribed total length of the plurality of channels is in relation to a prescribed Fresnel number.

23. The laser as set forth in Claim 22 wherein the prescribed Fresnel number is defined by the equation:

$$N_{fw} = W^2/4\lambda L_c$$

wherein L_c is the total length of the plurality of channels, W is the width of each channel and λ is the wavelength of the laser.

24. The laser as set forth in Claim 21 wherein the substantially rectangular cross section includes at least one rounded corner.

25. A laser comprising:

a housing;

a waveguide disposed within the housing, the waveguide defining a plurality of channels having a substantially rectangular cross section for guiding a laser beam;

a plurality of electrodes positioned along opposite surfaces of the waveguide; and

an optical housing mounted to the laser housing, the optical housing including a plurality of compartments for retaining a plurality of laser beam turning mechanisms, each of the plurality of compartments extending a corresponding distance from the laser housing whereby the plurality of compartments are accessible for adjusting the plurality of laser beam turning mechanisms.

26. The laser as set forth in Claim 25 wherein a first compartment extends a first distance from the laser housing, a second compartment extends a second distance from the laser housing and a third compartment extends a third distance from the laser housing.

27. The laser as set forth in Claim 25 wherein a first pair of compartments extend a first distance from the housing, a second pair of compartments extend a second distance from the housing and a single compartment extends a third distance from the housing.

28. The laser as set forth in Claim 25 wherein the optical housing includes:

a post;

a receptacle in the post for receiving the laser beam turning mechanisms therein;

a compression ring mounted on the post for applying a force radially towards the laser beam turning mechanisms thereby retaining the laser beam turning mechanisms in the receptacle;

a flexure mechanism connected to the post and to the optical housing; and

an adjustment mechanism engaging the post at a plurality of points for providing alignment of the laser beam turning mechanisms relative to the plurality of channels.

29. The laser as set forth in Claim 25 wherein the substantially rectangular cross section includes at least one rounded corner.

30. The laser as set forth in Claim 1 further comprising a periscope housing affixed to the laser housing for receiving a laser beam emitted from one of the plurality of channels of the waveguide and redirecting the laser beam.

31. The laser as set forth in Claim 30 wherein the periscope housing includes:

first and second mirrors each mounted at an angle of about 45 degrees relative to a longitudinal axis of the plurality of channels, the first mirror being disposed at an angle of about 90 degrees relative to the second mirror.

32. The laser as set forth in Claim 30 further comprising an optical beam shaping mechanism for receiving a laser beam emitted from one of the plurality of channels of the waveguide and shaping the laser beam.

33. The laser as set forth in Claim 1 wherein the plurality of channels subtend a prescribed angular orientation between adjacent channels.

34. The laser as set forth in Claim 33 wherein the plurality of channels subtend an angular orientation between adjacent channels of between approximately two degrees to five degrees.

35. The laser as set forth in Claim 1 wherein

a first electrode of the plurality of electrodes is positioned along a first surface of the plurality of waveguides and connected to a power supply; and

a second electrode of the plurality of electrodes is positioned along a second surface of the plurality of waveguides and connected to the laser housing.

36. The laser as set forth in Claim 35 wherein the first electrode comprises aluminum.

37. The laser as set forth in Claim 35 wherein the second electrode comprises a host metal having a native oxide having a thermal coefficient of expansion substantially equal to the host metal.

38. The laser as set forth in Claim 37 wherein the host metal comprises titanium.

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